

Example #10: A 120 V dc motor has an armature resistance of $5.0\ \Omega$ and draws 6.0 A when it is operating normally.

- What is the starting current of the motor just before the armature begins to turn
- What is the back EMF when it is operating properly?

a) At start-up, armature is not yet turning, so $V_{\text{back}} = 0$

$$\therefore \Sigma = I r_a$$

$$120 = I(5)$$

$$\boxed{I = 24\text{ A}}$$

b) With armature turning,

$$\begin{aligned} V_{\text{back}} &= \Sigma - I r_a \\ &= 120 - 6(5) \end{aligned}$$

$$\boxed{V_{\text{back}} = 90\text{ V}}$$